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<table>
<tr><td colspan="2">UTILITY PATENT APPLICATION TRANSMITTAL UNDER 37 CFR 1.53(b)</td><td colspan="2">ATTORNEY DOCKET 75063BTHC
Customer No. 01333.</td></tr>
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UTILITY PATENT APPLICATION
TRANSMITTAL UNDER 37 CFR 1.53(b)

ATTORNEY DOCKET 75063BTHC
Customer No. 01333.

Commissioner for Patents
Box Patent Application
Washington, D.C. 20231

DIGITAL CAMERA FOR CAPTURING A SEQUENCE OF FULL AND REDUCED RESOLUTION DIGITAL IMAGES AND STORING MOTION AND STILL DIGITAL IMAGE DATA

Express Mail Label No.

EL485199360US

Date: _October 11, 2000_

First Named Inventor (or Application Identifier):
Alexander C. Loui, et al

_10/11/00_

Enclosed are:

1. [X] Specification

2. [4] Sheet(s) of drawing(s)

3. [X] Information Disclosure Statement Under 37 CFR 1.97.

4. Combined Declaration for Patent Application and Power of Attorney:
    4a. [X] New
    4b. [ ] Copy from a prior application (37 CFR 1.63(d) (for continuation/divisional with Box 11 completed)

5. [-] Incorporation by Reference (useable if Box 4b is checked) The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

6. [X] Assignment of the invention to **Eastman Kodak Company**

7. [ ] Certified copy of a priority document.

8. [ ] Associate Power of Attorney

9. [ ] Deletion of Inventor(s).
Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).

10. [ ] If a 111A application prior to examination of the above-identified application, amend the specification at Page 1, after the title, by inserting the following:
--CROSS REFERENCE TO RELATED APPLICATION
        Reference is made to and priority claimed from U.S. Provisional Application Serial No. , filed , entitled .

If a CONTINUING APPLICATION, check appropriate box and supply the requisite information:

11. [ ] Continuation [ ] Divisional [X] Continuation-in-part (CIP) of prior application No: 09/606,513,

12. [X] Please address all written communications to Thomas H. Close, Patent Legal Staff, Eastman Kodak Company, 343 State Street, Rochester, NY 14650-2201.
Please Direct all telephone calls to Thomas H. Close at (716) 722-2396.

The filing fee has been calculated as shown below:

FOR:	NO. FILED		NO. EXTRA	RATE	FEE
BASIC FEE					$ 710
TOTAL CLAIMS	8	- 20 =	0	x 18 =	$ 0
INDEPENDENT CLAIMS	2	- 3 =	0	x 80 =	$ 0
[ ] MULTIPLE DEPENDENT CLAIM PRESENTED				+ 270	$0
				TOTAL	$ 710

[X] Please charge my Eastman Kodak Company Deposit Account No. **05-0225** in the amount of $ 710.
A duplicate copy of this sheet is enclosed

[X] The Commissioner is hereby authorized to charge any additional filing fees required under 37 CFR 1.16 or credit any overpayment to Eastman Kodak Company Deposit Account No. **05-0225**.
A duplicate copy of this sheet is enclosed.

Thomas H. Close/cjm
Telephone: (716) 722-2396
Facsimile: (716) 477-4646

Attorney for Applicants
Registration No. 27,428

Continuation-in-Part Application of Prior Applications:
09/606,513, filed June 29, 2000
08/864,403, filed May 28, 1997

Docket No: 75,063B

Inventors: Alexander C. Loui
                                                    Kenneth A. Parulski
                                                    Thomas Berarducci
                                                    William Jackson
                                                    Rajan Joshi

Attorney: Thomas H. Close

A DIGITAL CAMERA FOR CAPTURING A SEQUENCE OF FULL AND REDUCED RESOLUTION DIGITAL IMAGES AND STORING MOTION AND STILL DIGITAL IMAGE DATA

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A DIGITAL CAMERA FOR CAPTURING A SEQUENCE OF FULL AND REDUCED RESOLUTION DIGITAL IMAGES AND STORING MOTION AND STILL DIGITAL IMAGE DATA

5   **CROSS REFERENCE TO RELATED APPLICATIONS**

This is a continuation-in-part of U.S. Serial No. 09/606,513, filed

June 29, 2000 by Loui entitled *Integrated Motion-Still Capture System With*

Indexing Capability, which is a continuation of U.S. Serial No. 08/864,403, filed

May 28, 1997 by Loui entitled *Integrated Motion-Still Capture System With*

10   *Indexing Capability*.

FIELD OF THE INVENTION

The invention relates generally to the field of photography, and in

particular to combine motion and still image capture. More specifically, the

15   invention relates to a motion/still image capture system which captures image

sequences including both full and reduced resolution images and stores digital

image data to provide both motion video sequences and digital still pictures.

BACKGROUND OF THE INVENTION

20   Currently, it is common for consumers to use camcorders to

capture motion video images, which are viewed on a TV display, and film

cameras to capture still images which are developed and optically printed to

provide hardcopy prints. Carrying both types of devices is burdensome, however.

Thus, there is interest in having a digital camcorder type device that captures

25   motion images, while also allowing high quality prints to be produced from

selected image frames.

Recent advances in digital camcorders include the ability to capture

both motion and still images (commonly referred to as MOST cameras), and

associated audio information, such as those from JVC (GR-DV1) and Sony Corp.

30   (DCR-PC7) which allow the capture of motion video and still imagery. For

example, the GR-DV1 from JVC allows a user to capture a snapshot while

recording live video. Basically, the snapshot is indicated by overlaying a white
border on the particular still frame of the captured live video. See U.S. Patent No.
5,382,974, issued January 17, 1995 to Soeda et al. entitled ***Movie Camera Having
Still Picture Photographing Function and Method of Photographing Still***

5   ***Picture Therewith***, which shows a movie camera capable of also capturing still
images. Although these cameras allow one to capture motion and still images,
they do not provide adequate still image quality. Furthermore, the user must
decide before taking the picture whether a still or motion type image is desired.
Often, the user would like to have both a motion video sequence and a still image

10   of the same event (e.g. their daughter scoring the winning soccer goal). This is
difficult to do with these prior art systems, where the user must press a special
button to obtain a "still" image, rather than deciding at a later time what images
they would like to have as high resolution prints.

       A high definition camcorder could store a high resolution (e.g.

15   1280 x 960 pixels) motion sequence for each image frame, to provide higher
quality still images. However, to produce good motion rendition of high speed
objects, a high frame rate (e.g. 30 frames/sec) is required. The amount of data that
would need to be processed and stored per second (e.g. 1280 x 960 x 30 pixels)
would be excessive, requiring a high cost, power-hungry design having a limited

20   recording time.

       There is a need therefore for a digital motion/still camera design
that reduces the processing and storage requirements, while providing both good
motion rendition and the ability to obtain high resolution prints from any desired
scene after it has been captured.

25

SUMMARY OF THE INVENTION

       The need is met according to the present invention by providing a
method for simultaneously recording motion and still images, that includes the
steps of: capturing a motion image sequence and accompanying audio of a scene

30   with a digital video camera, adapted to record both motion and higher resolution

still images; simultaneously capturing a still image sequence having a higher resolution and lower frame rate than the motion capture sequence; compressing the motion image sequence using interframe compression and the accompanying audio and storing the compressed motion image and audio data; and compressing

5   the still images using intraframe coding and storing the compressed still image data.

ADVANTAGEOUS EFFECT OF THE INVENTION

The present invention provides a better way of capturing,

10   processing, and storing both motion and still images of the same event. Another advantage of this invention is that it records both still and motion images so that desired still images can later be selected for printing. Another advantage of this invention is that it uses the same image sensor and digital image processor to provide both the motion and still images. Another advantage of this invention is

15   that the still image processing does not need to be completed within the period set by the capture frame rate, so that the processor pixel operating rate can be reduced by balancing the processor load for still and motion images.

BRIEF DESCRIPTION OF THE DRAWINGS

20   Fig. 1 is a flow chart showing the operation of the motion/still imaging system according to the present invention;

Fig. 2 shows the user interface employed in the motion/still imaging system of the present invention;

Fig. 3 is a block diagram illustrating a motion/still image capture

25   system according to the present invention;

Fig. 4 is a diagram illustrating the motion capture and processing sequence used in the present invention; and

Fig. 5 is a diagram illustrating the data structure for storing the motion sequences and still images.

To facilitate understanding, identical reference numerals have been used, where possible, to designate identical elements that are common to the figures.

DETAILED DESCRIPTION OF THE INVENTION

5

Referring to Fig. 1, the operation of the system of the present invention will be described. In a capture step **10**, a motion/still camera **12** is operated in a motion/still capture mode, to alternately capture a series of both full resolution and reduced resolution images of a subject **14** while continuously

10 capturing a digital audio signal. According to the present invention, a full resolution image contains at least four times as many pixels as a reduced resolution image. Alternatively, the user can change the camera mode using user controls **66** (see Fig. 3) to capture only reduced resolution motion images, or only a single full resolution still image. Both the full and reduced resolution images are

15 digitized **16** in the camera. The reduced resolution images, and a similar sized low resolution image derived from the full resolution images, are compressed **18** using an interframe compression algorithm operating at a relatively high compression ratio, while the full resolution images **20** are compressed using only intraframe compression at a relatively low compression ratio, to provide high image quality.

20 The high resolution image compression can either use as an input the complete full resolution image, or can alternatively compress the difference image (e.g. the residual image) obtained by decompressing and subtracting the low resolution image to be stored as part of the compressed low resolution sequence from the full resolution image of the same image frame.

25

Compression of the motion sequence is necessary to lower the bandwidth and storage requirements. For instance, an NTSC format video signal with a frame rate of 29.97 Hz when digitized will result in an uncompressed bit rate of about 168 Mb/s. MPEG (Moving Picture Expert Group) compression of an NTSC video signal can result in a bit rate of 3 to 6 Mb/s with a quality comparable

30 to analog cable TV and far superior to VHS video tape. The full resolution images

used to provide high quality still images are obtained much less frequently than the motion images, and have higher resolution and less aggressive compression. A regular sequence of high resolution still image frames and low resolution compressed audio/video frames is generated **22**. Such a sequence is created

5   whenever the user presses the record button while the camera **12** is in the combination motion/still (MOST) mode. The camera **12** takes a fixed number of images per second (e.g. 24 or 30 frames per second) to provide the motion sequence. A relatively small number of these images (e.g. 2 frames per second, or every 12th or 15th image) are normally full resolution images, while the others are

10   reduced resolution images. The user can set the frequency of full resolution images using user controls **66**, in order to record more high resolution images per second for important but short events, or alternatively fewer high resolution images per second, to reduce the amount of still image related data that must be recorded, in order to increase the recording time.

15   The full and reduced resolution images can be created using the image sensor described in commonly-assigned U.S. Patent No. 5,440,343 issued August 8, 1995 to Parulski et al., entitled *Motion/Still Electronic Image Sensing Apparatus*, the disclosure of which is incorporated herein. Alternatively, the image sensor can always read out a full resolution image using a relatively high

20   speed clock, and the reduced resolution images can be obtained by averaging or subsampling (e.g. decimating the image 2:1 both vertically and horizontally) this full resolution image sequence.

             The low resolution video data and high resolution image data can be stored **24** on a digital storage medium, such as CD ROM medium or a DVD

25   (Digital Versatile Disk) medium **26**. Alternatively, the data can be stored on digital videotape, a magnetic hard drive, or Flash EPROM memory, or any other digital storage device. Alternatively, the data can be stored on an image server through a wireless or wired network link. The stored data may also include metadata, such as user-input text information and camera-generated information

30   such as time, date, camera model and serial number, lens settings, etc.

The structure of the image files that store the low resolution motion video and high resolution still image data are described below. The display and printing of these digital image files **28** are carried out at a user's video player terminal (which may utilize the digital camera **12** for image playback) or

5   computer, and are enabled by an image processing sub-system in the terminal or computer that decompresses the image files. Through the terminal or computer, the user can view and browse the low resolution video sequences, and selectively print any associated high resolution still frames.

A user interface of the terminal or computer is depicted in FIG. 2.

10   The user interface **30** is displayed on a CRT **31** driven by the terminal or computer, which may be, for example, a personal computer (PC) **33**, having an operating system **37**, such as the well-known Windows 98™, or Windows 2000™ operating systems from Microsoft, Inc., Redmond, Oregon, and application software **39** for generating the graphical user interface and performing the image

15   processing, decoding and display functions described herein. The PC **33** is connected to operator interfaces such as a keyboard **45** and a mouse **35**. The basic features of the interface display **30** include an array of index images **32** representing each motion sequence. Using a mouse **35**, an operator can double click on one of the index images **32** to display the associated audiovisual segment,

20   which may be, for example, an MPEG-2 compliant audio/video file, in window **34**. The MPEG-2 video compression is defined in "Generic coding of moving pictures and associated audio information: Video," *ISO/IEC 13818-2, MPEG-2 Video International Standard*, 1996. Alternatively, other types of MPEG compression, such as MPEG-1 or MPEG-4, may be used. The audio portion of

25   the MPEG segment is played on the stereo speakers **36**. Using the mouse **35**, the operator can drag and drop any one of the index images into a start window **38** and another one later in the sequence into a stop window **40**. When the operator clicks on the "PLAY" button **42**, the MPEG sequences associated with the start and stop sequences, and all sequences in between, will be played in window **34**.

While any sequence is playing, the operator can single click on the print button **44** to initiate a printing operation. When the print button is depressed, the image frame corresponding to the last high resolution image is displayed in window **34**. The user can skip back to the previous high resolution image by single clinking on the back arrow **41**, or can rapidly move to earlier high resolution images by "clicking and holding" back arrow **41**. Similarly, the user can skip forward to the next high resolution image by single clicking on the forward arrow **43**, or can rapidly move to later high resolution images by "clicking and holding" back arrow **41**. When the user double-clicks on the print button **44**, a print is produced from the high resolution still image data for this image frame on a color printer **47** such as an ink jet or laser printer, that is connected to the user's terminal or personal computer **33**.

The architecture of the digital motion/still camera **12** is illustrated in FIG. 3. The digital camera **12** produces digital image files that are recorded using a digital recorder **48**. The camera is powered by batteries **80** which connect to power supply **82**, which supplies power to the camera circuits depicted in FIG. 3. The digital camera **12** includes a zoom lens **51** having zoom and focus motor drives **53** and an adjustable aperture (not shown). The user composes the scene using the electronic viewfinder **72** and the zoom lens control buttons (not shown) of the user controls **66**, and then depresses a record button (not shown) to begin capture of a motion/still image sequence. The zoom lens **51** focuses light from a subject **14** (see FIG 1) on an image sensor **50**, for example, a single-chip interline color CCD image sensor using the well-known Bayer color filter pattern. The image sensor may be an interline format sensor having 1280 columns x 960 rows of active pixels. The image sensor **50** is controlled by timing generator/clock drivers **70**. The zoom and focus motors **53** and the clock drivers **70** are controlled by control signals supplied by a control microprocessor **68**. The analog output signal from the image sensor **50** is amplified and converted to digital data by the analog signal processing (ASP) and analog-to-digital (A/D) converter circuit **52**.

The camera **12** also includes a microphone **56** and an audio A/D converter **58** for providing a digital audio signal to digital processor **68**.

The digital data from ASP and A/D **52** includes both full resolution image frames that are used to produce both high resolution still image data and a

5   low resolution motion image data, and reduced resolution image frames that are only used to provide low resolution motion image data. As described earlier, the image sensor **50** can use the invention described in U.S. Patent No. 5,440,343 to provide full resolution (e.g. 1280 x 960 pixel) images and reduced resolution (e.g. 640 x 480 pixel) images by summing and dumping appropriate color pixels.

10   Alternatively, the sensor can provide only full resolution (e.g. 1280 x 960 pixel) images, and a 2:1 subsampling circuit **54** can be used to produce the reduced resolution image by appropriately averaging the digital sensor pixel values. The ASP and A/D **52** is coupled to a full resolution buffer memory **60** which stores a full resolution (e.g. 1280 x 960 pixel) still image. The 2:1 subsampling circuit **54**

15   is coupled to a multi-frame reduced resolution buffer memory **62**, which can store multiple reduced resolution images, such as buffer memory that can store four 640 x 480 pixel images.

The outputs of the full resolution buffer memory **60** and the multi-frame reduced resolution buffer memory **62** are coupled to a multiplexer switch **64**

20   which provides an input to control microprocessor **68**. The digital audio data from audio A/D **58** is also input to control microprocessor **68**. The processed image and audio data is coupled to a digital recorder **48** which stores the digital image files. The digital recorder can use write-once or erasable CD or DVD optical disks. Alternatively, the digital recorder can use other digital storage

25   technologies, such as magnetic hard drives, magnetic tape, optical tape, or solid-state memory.

The control microprocessor **68** alternates between processing one full resolution image from full resolution buffer memory **60**, followed by several reduced resolution images from multi-frame reduced resolution buffer memory **62**.

30   As will be described later in reference to Fig. 4, since the full resolution images

have more pixel data (e.g. 4 times as many pixels) than the reduced resolution images, the processor spends a longer period of time processing a full resolution image than it does processing a reduced resolution image, while the time period between each sensor exposure must remain constant, in order to prevent motion

5   artifacts. Therefore, the arrangement of the two buffer memories **60** and **62** allows the processing load to be better balanced by allowing the control microprocessor **68** to spend a longer period of time processing the full resolution images.

For each full and reduced resolution image frame, the control microprocessor **68** performs color interpolation followed by color and tone

10   correction, in order to produce rendered sRGB image data. For full resolution frames, the control microprocessor **68** creates both full resolution (e.g. 1280 x 960 pixel) sRGB image data, and low resolution (e.g. 640 x 480 pixel) sRGB image data. For reduced resolution frames, the digital processor creates only low resolution (e.g. 640 x 480 pixel) sRGB data. The control microprocessor **68** also

15   creates, from the low resolution image data of each full and reduced resolution image frame, a "thumbnail" size image, which can be created as described in commonly-assigned U.S. Patent No. 5,164,831 issued November 17, 1992 to Kuchta et al., entitled ***Electronic Still Camera Providing Multi-Format Storage of Full and Reduced Resolution Images***, the disclosure of which is herein

20   incorporated by reference. This thumbnail image has 160 x 120 pixels and is displayed on electronic viewfinder **72** as the image sequences are captured. The digital processor **66** can also provide a video output signal **74**, as either a digital or analog video signal, which is encoded for display on a standard TV display (not shown), such as an NTSC video display. The digital processor also compresses

25   the digital audio signal from audio A/D **52**, in order to provide an MPEG compressed audio stream.

The rendered sRGB low resolution image data from both the full and reduced resolution frames is then compressed, processed and stored, along with the compressed audio data, as an MPEG-2 bitstream. The processing may

30   include conversion form RGB data to alternate color spaces, such as YUV, YIQ,

or Y,Cb,Cr as described in chapter 3 of "Video Demystified" by Keith Jack, published by HighText Interactive Inc., SanDiego, CA copyright 1996. In the MPEG-2 standard, frames are designated I, P or B. I indicating that the frame is intra-coded (the encoding is not dependent on any other frame); P indicating the frame is predicted from the previous frame; and B indicating that the frame is predicted from both the previous and future frames. In one embodiment of the present invention, the low resolution image frames derived by subsampling the full resolution image frames are preferably compressed as I frames. This is because each I frame can be decoded as a low resolution image, so that the full resolution image data can be stored as the difference between this I frame low resolution image and the full resolution image.

The rendered sRGB full resolution image data from the full resolution frames is also compressed and stored to provide high resolution still image data. In one embodiment, the difference (residual) between the sRGB full resolution image data, and the upsampled low resolution I frame image decompressed from the MPEG-2 bitstream is computed, and then compressed and stored as a complete still image file. To recover the full resolution still image data, the residual still image file and the corresponding MPEG-2 I frame are both decompressed and combined. In an second embodiment, the full resolution still image data is JPEG compressed and stored as a complete still image file. The MPEG-2 and still image files can store metadata, such as the date and time the picture was captured, the lens f/number and other camera settings, and image captions or comments that can be selected or entered by the camera user.

The motion capture and processing sequence used in the digital camera **12** of the present invention will now be described with reference to Fig. 4, and the structure of the digital files stored by the digital recorder **48** of the present invention will now be described with reference to Fig. 5. The capture sequence shown in Fig. 4 shows that a new image is captured every 1/30 second, and that the capture sequence has provided one high resolution frame **102**, followed by four low resolution frames **104**, so that a high resolution frame is captured every

1/6 of a second. Thus, there are 4 low resolution frames in between each full resolution frame. Alternatively, other ratios of low to full resolution frames can be used, and the digital camera 12 can include user controls 66 to allow the user to set this ratio, and to set the capture sequence frame rate to a value other than 30

5   frames per second.

In conventional camcorders, the processing time for each video frame is equal to one frame period. In the present invention, however, the processing time for the full resolution frames is set to be substantially longer than the processing time for the reduced resolution frames. As shown in Fig. 4, the

10   processing time for each full resolution frame 112 may be 1/12 second, which is four times as long as the 1/48 second processing time for each reduced resolution frame 114. Thus, the control microprocessor 68 is allocated more time to create and compress the sRGB still images for the full resolution frames as well as create and MPEG-2 compress the low resolution image data. For the reduced resolution

15   frames, the digital processor needs less time, since it is only processing and MPEG-2 compressing the low resolution image data.

As shown in Fig. 5, the stored image files for each captured image sequence include an MPEG-2 sequence bitstream 200 and a number of high resolution compressed image files 210 which are used to provide high resolution

20   still images. Pointers 220 relate each high resolution compressed image file to a particular I frame 202 from the MPEG-2 motion sequence. The pointers 220 may be provided by metadata in the MPEG-2 bitstream that provides an identifier of the appropriate high resolution compressed image file 210 associated with each I frame 202. Alternately, the pointers 220 may be provided by comparing the exact

25   time recorded in the metadata of both the MPEG-2 bitstream for each I frame 202 and also recorded in each high resolution compressed image file 210, or by using a separate synchronization file.

The MPEG-2 frames corresponding to the reduced resolution frames 104 (see Fig. 4) are compressed either as B frames 204 or as P frames 206,

30   rather than as I frames. As stated earlier, I indicates that the frame is intra-coded,

P indicates the frame is predicted from the previous frame; and B indicates that the frame is predicted from both the previous and future frames.

The invention has been described with reference to a preferred embodiment. However, it will be appreciated that variations and modifications can be effected by a person of ordinary skill in the art without departing from the scope of the invention.

PARTS LIST

10	capture step x
12	motion/still camera x
14	photographic subject x
16	digitize step x
18	compress video step x
20	full resolution image x
22	generate sequence x
24	storage step x
26	writable medium x
28	display, review and print step x
30	user interface display x
31	CRT x
32	array of index images x
33	personal computer x
34	playback window x
35	mouse x
36	stereo speakers x
37	operating system x
38	start window x
39	application software x
40	stop window x
41	back arrow x
42	play button x
43	forward arrow x
44	print button x
45	keyboard x
47	color printer x
48	digital recorder x
50	image sensor x
51	zoom lens x
52	video A/D converter x
53	zoom and focus motor drives x
54	2:1 subsampler x
56	microphone x

58	audio A/D converter x
60	full resolution buffer memory x
62	reduced resolution buffer memory x
64	multiplexer switch x
66	user controls x
68	control microprocessor x
70	timing circuit x
72	electronic viewfinder x
74	video output signal x
80	batteries x
82	power supply x
102	high resolution frame x
104	low resolution frame x
112	processing time for high resolution frame x
114	processing time for low resolution frame x
200	MPEG-2 bitstream x
202	I frame x
204	B frame x
206	P frame x
210	high resolution compressed image files x
220	pointer x

CLAIMS:

1. A method for simultaneously recording motion and still images, comprising the steps of:

a) capturing a motion image sequence and accompanying audio of a scene with a digital video camera adapted to record both low resolution motion image sequences and high resolution still images;

b) simultaneously capturing a still image sequence having full resolution images and lower frame rate than the motion capture sequence;

c) compressing the motion image sequence using interframe compression and the accompanying audio and storing the compressed motion image sequences and audio data; and

d) compressing the still images using intraframe coding and storing the compressed still image data.

2. A digital motion/still camera comprising:

a) an image sensor for providing a sequence of image frames;

b) means for providing a repeating sequence of full resolution image frames regularly interspersed between reduced resolution image frames;

c) a first image buffer for storing at least one full resolution frame of pixel values;

d) a second image buffer for storing a plurality of reduced resolution frames of pixel values; and

e) a digital recorder coupled to the first and second image buffers for storing a repeating sequence of full and reduced resolution frames of pixel values.

3. The digital motion/still camera of claim 2, wherein the repeating sequence has a single full resolution frame followed by a plurality of low resolution frames.

4. The digital motion/still camera of claim 2, wherein the full resolution image is stored using a low resolution component stored as part of a motion sequence, and a full resolution component.

5. The digital motion/still camera of claim 2, wherein the apparatus further includes a processor coupled to the first image memory, that processes the stored full resolution frames prior to recording, and produces from a full resolution image frame both a low resolution frame and a high resolution image frame.

6. The digital motion/still camera of claim 5, wherein the processing period for the still image is longer than the capture frame period.

7. The digital motion/still camera of claim 6, wherein the processor also processes the reduced resolution frames in a processing period that is shorter than the capture frame period.

8. The digital motion/still camera of claim 2, further comprising a control for allowing the operator to set the number of full resolution frames to be captured per second.

ABSTRACT OF THE DISCLOSURE

A method for simultaneously recording motion and still images, includes the steps of: capturing a motion image sequence and accompanying audio of a scene with a digital video camera adapted to record both motion and

5   higher resolution still images; simultaneously capturing a still image sequence having a higher resolution and lower frame rate than the motion capture sequence; compressing the motion image sequence using interframe compression and the accompanying audio and storing the compressed motion image and audio data; and compressing the still images using intraframe coding and storing the

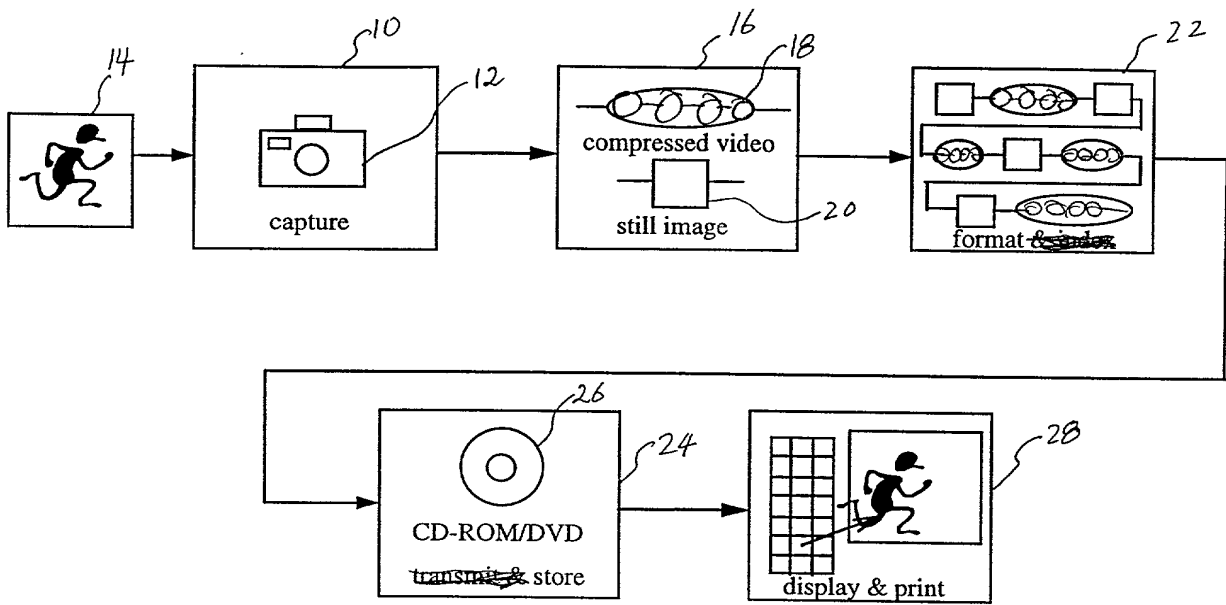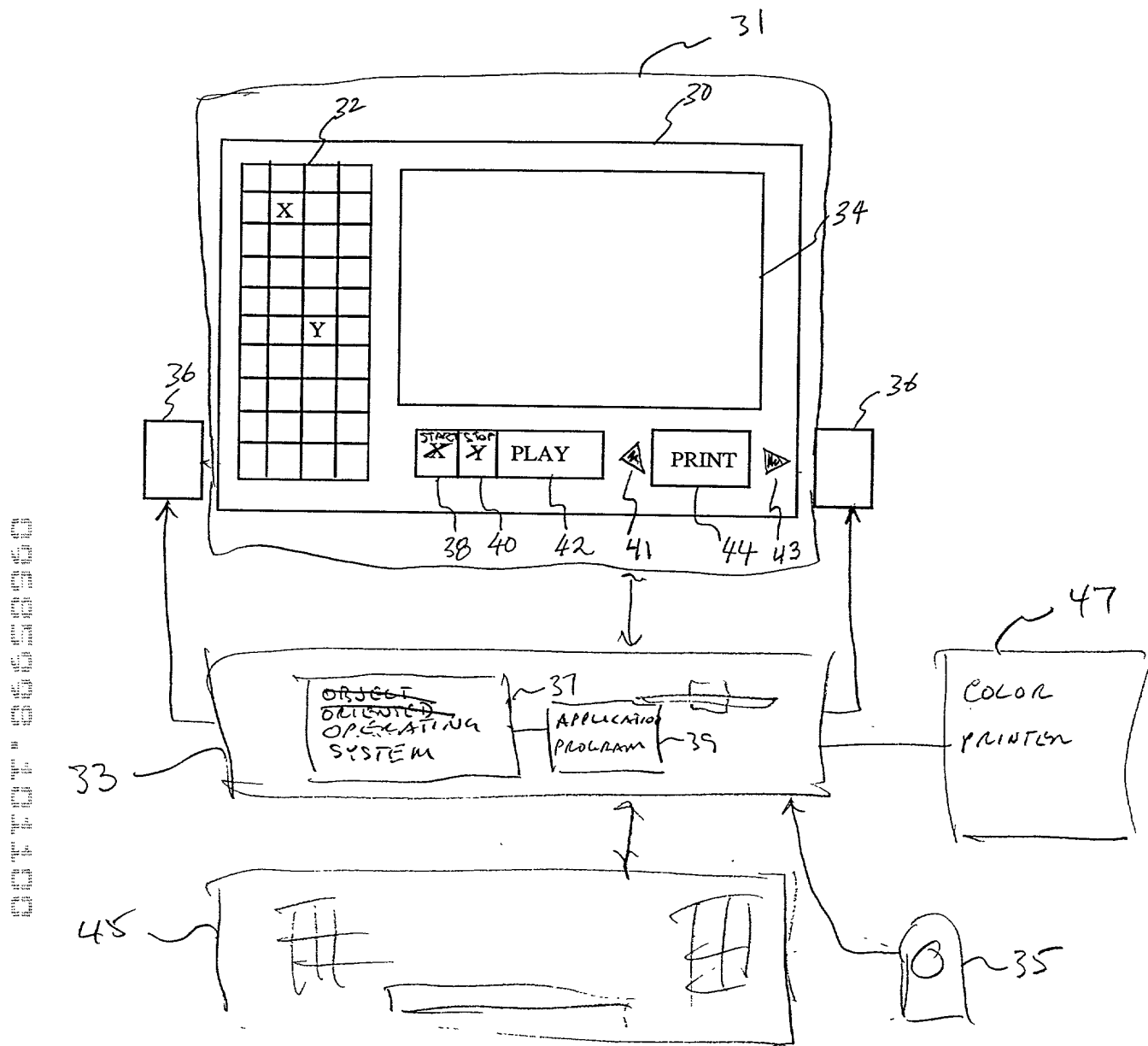10   compressed still image data.

FiG. 1

START X	STOP Y	PLAY	PRINT

38 40 42 41 44 43

31

32

30

34

36

36

47

COLOR PRINTER

OBJECT ORIENTED OPERATING SYSTEM 37

APPLICATION PROGRAM 39

33

45

35

FIG. 2

12

56 MIC
58 A/D
51 ZOOM Lens
50 Image Sensor
53 LENS MOTOR DRIVES
70 TIMING GENERATOR/ CLOCK DRIVERS
52 ASP and A/D
54 2:1 Sub-sample
60 Full resolution Buffer Memory
62 REDUCED RES BUFFER MEMORY
64
66 Digital Processor
74 VIDEO OUTPUT
48 Digital Recorder
72 ELECTRONIC Viewfinder
66 USER Controls
68 CONTROL MICROPROCESSOR
80 BATTERIES
82 POWER SUPPLY

FIG. 3

Capture sequence

| FULL HIGH res frame #1 | REDUCED Low res frame | REDUCED Low res frame | REDUCED Low res frame | REDUCED Low res frame | FULL HIGH res frame #2 | REDUCED Low res frame | REDUCED Low res frame | - - - |

102   104   102   104

← 1/30 sec. →

←   1/6 sec.   →

Processing times

112   114   112   114

| FULL HIGH res frame #1 | REDUCED Low res frame | REDUCED Low res frame | REDUCED Low res frame | REDUCED Low res frame | FULL HIGH res frame #2 | Low res frame | - - - |

←   1/12 sec.   →   ← 1/48 → sec.

FIG. 4

200 ～

Motion sequence (MPEG 2)

202   204   206   204   206   202   204   206

| Low res data from frame #1 | Low res frame data | Low res frame data | Low res frame, data | Low res frame data | Low res from frame #2 | Low res frame data | Low res frame data | - - - |

A I   B   P   B   P   A I   B   P

220   220

Still images (JPEG or residual coding)

| HIGH res frame #1 COMPRESSED IMAGE | | FULL HIGH res frame #2 COMPRESSED IMAGE | - - - |

210   210

FIG. 5

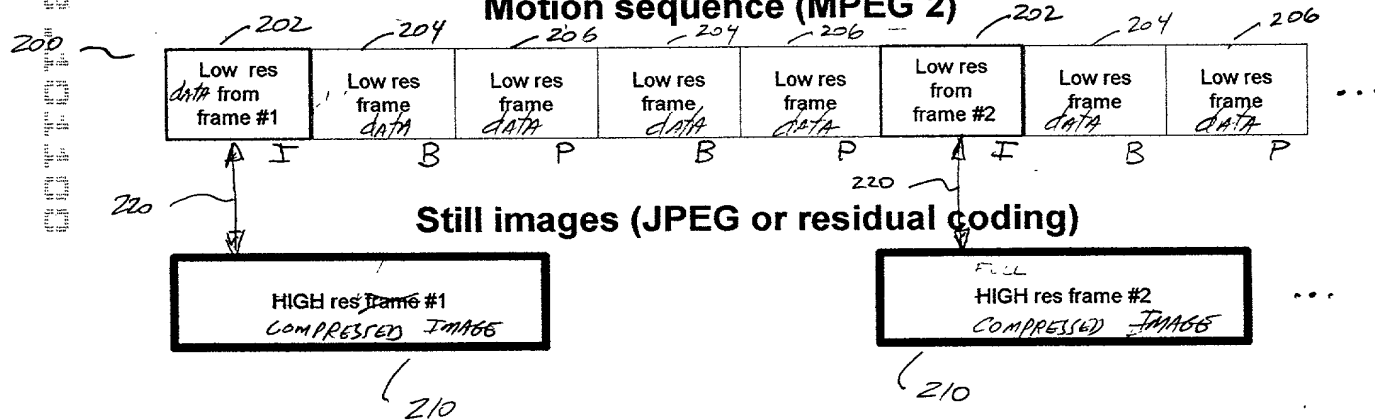| Combined Declaration For Patent Application and Power of Attorney	ATTORNEY DOCKET 75063BTHC

As below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

A DIGITAL CAMERA FOR CAPTURING A SEQUENCE OF FULL AND REDUCED RESOLUTION DIGITAL IMAGES AND STORING MOTION AND STILL DIGITAL IMAGE DATA

The specification of which (check only one item below):

X	is attached hereto.
	was filed as United States Application Serial No. on and was amended on (if applicable).
	was filed as PCT international application Number on and was amended under PCT Article 19 on (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the U.S. Patent & Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign applications(s) for patent or inventor's certificate or any PCT international application(s) designating a least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

COUNTRY (if PCT, indicate PCT)	APPLICATION NUMBER	DATE OF FILING (day month year)	PRIORITY CLAIMED UNDER 35 USC §119	
			YES	NO
			YES	NO
			YES	NO

I hereby claim the benefit under Title 35, United States Code, 119 §(e) of any United States provisional application(s) listed below:

PRIOR PROVISIONAL APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. §119 (e):

PROVISIONAL APPLICATION NUMBER	FILING DATE

I hereby claim the benefit under Title 35, United States Code, §120 of any prior United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior applications(s) in the manner provided by the first paragraph of Title 35, §112, I acknowledge the duty to disclose to the U.S. Patent & Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations §1.56, which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR US APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S FOR BENEFIT UNDER 35USC§120:

U S APPLICATIONS		STATUS (Check one)		
U.S APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED
09/606,513	June 29, 2000		X	
08/864,403	May 28, 1997		X	
PCT APPLICATIONS DESIGNATING THE U.S.				
PCT APPLICATION NO.	PCT FILING DATE	U.S. SERIAL NUMBERS ASSIGNED (if any)		

POWER OF ATTORNEY: As a named inventor, I hereby appoint the attorney(s) and/or agent(s) associated with Eastman Kodak Company Customer No. 01333 to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

Send Correspondence to:

Patent Legal Staff
Eastman Kodak Company
343 State Street
Rochester, NY 14650-2201

Direct Telephone Calls to:
(name and telephone number)

Thomas H. Close
(716) 722-2396
FAX: (716) 477-4646

	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
2		Loui	Alexander	C.
0	RESIDENCE & CITIZENSHIP	CITY Penfield	STATE OR FOREIGN COUNTRY New York 14526 USA	COUNTRY OF CITIZENSHIP Canadian
1	BUSINESS ADDRESS	BUSINESS ADDRESS Eastman Kodak Company	CITY 343 State Street, Rochester	STATE & ZIP CODE (COUNTRY) New York 14650 USA
2	FULL NAME OF INVENTOR	FAMILY NAME Parulski	FIRST GIVEN NAME Kenneth	SECOND GIVEN NAME A.
0	RESIDENCE & CITIZENSHIP	CITY Rochester	STATE OR FOREIGN COUNTRY New York 14617 USA	COUNTRY OF CITIZENSHIP USA
2	BUSINESS ADDRESS	BUSINESS ADDRESS Eastman Kodak Company	CITY 343 State Street, Rochester	STATE & ZIP CODE (COUNTRY) New York 14650 USA
2	FULL NAME OF INVENTOR	FAMILY NAME Berarducci	FIRST GIVEN NAME Thomas	SECOND GIVEN NAME N.
0	RESIDENCE & CITIZENSHIP	CITY Webster	STATE OR FOREIGN COUNTRY New York 14580 USA	COUNTRY OF CITIZENSHIP USA
3	BUSINESS ADDRESS	BUSINESS ADDRESS Eastman Kodak Company	CITY 343 State Street, Rochester	STATE & ZIP CODE (COUNTRY) New York 14650 USA
2	FULL NAME OF INVENTOR	FAMILY NAME Jackson	FIRST GIVEN NAME William	SECOND GIVEN NAME M.
0	RESIDENCE & CITIZENSHIP	CITY Victor	STATE OR FOREIGN COUNTRY New York 14564 USA	COUNTRY OF CITIZENSHIP USA
4	BUSINESS ADDRESS	BUSINESS ADDRESS Eastman Kodak Company	CITY 343 State Street, Rochester	STATE & ZIP CODE (COUNTRY) New York 14650 USA
2	FULL NAME OF INVENTOR	FAMILY NAME Joshi	FIRST GIVEN NAME Rajan	SECOND GIVEN NAME L.
0	RESIDENCE & CITIZENSHIP	CITY Pittsford	STATE OR FOREIGN COUNTRY New York 14534 USA	COUNTRY OF CITIZENSHIP Indian
5	BUSINESS ADDRESS	BUSINESS ADDRESS Eastman Kodak Company	CITY 343 State Street, Rochester	STATE & ZIP CODE (COUNTRY) New York 14650 USA
2	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
0	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
6	BUSINESS ADDRESS	BUSINESS ADDRESS	CITY	STATE & ZIP CODE (COUNTRY)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 201	SIGNATURE OF INVENTOR 202	SIGNATURE OF INVENTOR 203
DATE 8/24/00	DATE 9/13/2000	DATE 10-9-00
SIGNATURE OF INVENTOR 204	SIGNATURE OF INVENTOR 205	SIGNATURE OF INVENTOR 206
DATE 10-9-00	DATE 31st August 2000	DATE